very much as we would reply to the above correspondent, viz: that the north and east winds are cold in and of themselves, quite independent of the temperature of Lake Michigan, and if they do produce cold weather at Chicago or at Riley station it is not because the Chicago River has drawn cold water to the southern part of the lake nor because the lake has a cooling influence on the air as far west as Riley station.

The direct influence of the lake water upon the temperature of the air is appreciable for a few miles only; the indirect influence, by reason of the formation of cloud and rain, may be felt for 50 miles. This subject was studied very thoroughly by Prof. Alexander Winchell, of Ann Arbor, Mich., in a paper published in the Proceedings of the American Association for the Advancement of Science for 1870, Vol. XIX, pp. 106–117. Two charts accompanied this paper showing the mean monthly temperatures for July and January. It may be assumed that the means were taken by the ordinary rule 1/4 ($7+2+2\times9$). These charts show a great irregularity in the isotherms, which irregularities may be ascribed in part to direct atmospheric action, since the Lake region is a cloudy and rainy region toward which all the storm tracks of the American continent converge; it is also the region where warm southerly and cool northerly winds mingle with a special frequency. Owing to the cloud, rain, and storm frequency this is also a region of heavy forests and lakes and swamps, both large and small. The latter are undoubtedly the product of the former. It is not right to say that the Lake region is cool, stormy, and moist because of the lakes, but because of the presence of the storms.

If the lakes have any decided influence on the temperature it must be only a slight differential effect, which would become visible by comparing the temperatures on opposite sides of a lake when the general wind is blowing steadily in one direction. Professor Winchell's isotherms for July show that stations on opposite sides of Lake Michigan, directly east and west of each other and close to the lake shore, have precisely the same temperature from Chicago and New Buffalo, at the south end up to Mackinaw at the north. His isotherms for Lake Ontario show almost the same thing. His isotherms for January, on the other hand, show that the west coast of Lake Michigan is 5° or 10° colder than the east shore, that is to say, the air whose temperature averages between 20° and 30° grows slightly warmer as the west winds of January blow eastward over the frozen lake. In crossing over the Peninsula of Michigan from west to east temperatures generally grow colder by 3° or 4°, due to the fact that the warming influence of the clouds on the east shore of Lake Michigan disappears as we proceed toward the east. Thus, the January isotherm of 23°, passing near Chicago, runs northward to Northport, Mich., thence south to Lansing, then north until it nearly reaches Alpena, and thence eastward over Lake Huron, and southeast into New York.

HYDROGRAPHY OF NICARAGUA.

For several years past we have published in the MONTHLY WEATHER REVIEW all the meteorological data that have been offered to us relative to the climate of Central America, especially Panama and Nicaragua. These publications have been appreciated by those who are studying the conditions that must attend any effort to construct inter-oceanic canals across those portions of Central America. Through the activity of the engineers employed by the boards appointed by Congress to investigate the feasibility of a canal between the Atlantic and Pacific Oceans (viz: the "Canal Board of 1895," the Nicaragua Canal Commission of 1897, and the Isthmian Canal Commission of 1899), a large addition has been made during the past five years to our knowledge of the climate of Central America. In the Twentieth Annual Report of the United States Geological Survey is given a review of the rainfall data and the height and flow of rivers and the fluctuations of Lake Nicaragua (as also the evaporation of water, the formation of river sediments, and other matters affecting the canal question) in a short paper on the hydrography of Nicaragua by Arthur P. Davis, of the United States Geological Survey, Engineer to the Nicaragua Canal Commission of 1897. Still more recent data will, undoubtedly, be presented to Congress in the final report of the Isthmian Canal Commission appointed to decide on the relative merits of the various proposed canals.

OFFICIAL ORGANS.

All communications between the Chief of the Weather Bureau and the observers, both regular and voluntary, proceed by formal letters or circulars and are never sent through any official organ, so-called. For fear lest some mistake may be made in the minds of our readers it is proper to say that whatever is printed in the MONTHLY WEATHER REVIEW under the name of any contributor, officer, or editor is to be viewed as a personal expression and without any official authority, unless that phrase is expressly used by the Chief himself, or his authorized representative.

Not long since a circular was received announcing the establishment of a new journal to be published in the interest of the voluntary observers of the Weather Bureau. These observers have been voluntarily keeping weather records and communicating copies to the Weather Bureau for the public benefit, and the Weather Bureau, in return, has done for them all that it is officially able to do in the way of supplying public documents and, in exceptional cases, thermometers and other instruments.

The first letter received by the Chief of Bureau relative to the new journal, spoke of it as the organ of a scientific society, and to that letter a most cordial response was given, but no article was "contributed" by the Chief. The subsequent letter and circular, and the first number itself of the journal, shows that it aspires to be the official organ of the voluntary observers of the Weather Bureau, a project to which the Chief of the Weather Bureau can not possibly be expected to lend any encouragement. As a journal of meteorology, climatology, and allied sciences Earth and Air is to be heartily encouraged by the Weather Bureau, just as it encourages Popular Science and all other scientific journals, but there is no need for its existence as an official organ.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology.

The month was characterized by general stagnation in the lower layers of the atmosphere. East of the Rocky Mountains and north of the Gulf States the weather was abnormally warm, the monthly mean temperatures surpassing, in many instances, those registered in tropical countries. The skies were generally free from clouds, especially at night, and rainfall was deficient over large areas east of the Mississippi. In Nebraska, the Dakotas, Minnesota, northern Wis-

consin, and portions of Iowa an abundance of rain fell. West of the Rocky Mountains temperature was below the seasonal average, and rainfall was also below normal. Drought prevailed in Arizona, portions of New Mexico, Colorado, and Wyoming.

There was a marked absence of violent local storms and destructive tornadoes, and the highs and lows, while following beaten paths, moved very slowly.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV, and the numerical values are given in Tables I and X.

The distinguishing characteristic of this chart is the landward extension of the high which usually covers the Carolinas, eastern Tennessee, and Georgia. The low in the Rocky Mountain and Plateau regions is deeper than usual, and the general configuration of the monthly mean isobars is typical of abnormally hot weather in the Lake region, the Ohio Valley, and the Middle States, as well as the Piedmont Plateau. Pressure was below normal at Bermuda, but about normal at West Indian stations. It would be interesting to know whether pressure was also below normal in the Azores.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

Temperature was continuously high east of the Rocky Mountains and north of the Gulf States, except in New England, the daily departures being as high as 8° above the average in one or two cases; generally, however, the daily departures ranged from 2° to 6° above the average. West of the Rocky Mountains the reverse conditions obtained, temperature being from 2° to 6° below the average, except on the immediate Pacific coast. The extremes of temperature were not unusually high, although in one or two cases the record of thirty years was equaled or exceeded. Further details with regard to the hot spell are given on page 333.

The average temperature for the several geographic districts and the departures from normal values are shown in the following table:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	68.6	+ 2.0	+ 5.7	+ 0.7
Middle Atlantic	12	78.2	+ 5.0	+ 8.5	+ 1.1
South Atlantic	10	82.9	+ 4.4	+ 0.8	+ 0.1
Florida Peninsula	7	82.8	+ 1.7	− 5.3	− 0.7
East Gulf	7	81.9	+ 2.2	− 6.4	− 0.8
West Gulf	7	81.7	+ 1.2	+ 1.7	+ 0.2
Ohio Valley and Tennessee	12	80.2	+ 5.4	+ 2.9	+ 0.4
Lower Lake	8	74.4	+ 5.0	+ 3.1	+ 0.4
Upper Lake	9	71.8	+ 6.1	+11.3	+ 1.4
North Dakota	8	71.1	+ 4.6	+36.4	+ 4.6
Upper Mississippi Valley	11	79.8	+ 7.0	+12.1	+ 1.5
Missouri Valley	10	78.4	+ 5.5	+21.9	+ 2.7
Northern Slope	7	69.1	+ 1.2	+30.8	+ 3.8
Middle Slope	6	78.2	+ 3.6	+16.3	+ 2.0
Southern Slope	6	78.4	+ 1.0	+ 4.2	+ 0.5
Southern Plateau	15	74.3	− 2.7	+ 7.8	+ 1.0
Middle Plateau	9	67.2	− 3.1	+17.8	+ 2.2
Northern Plateau	10	63.2	− 4.9	+23.4	+ 2.9
North Pacific	9	60.4	− 1.7	+12.5	+ 1.6
Middle Pacific	5	63.9	− 0.9	+ 7.8	+ 1.0
South Pacific	4	68.7	− 2.8	+ 9.0	+ 1.1

In Canada.—Acting Director B. C. Webber says:

Temperature conditions for the month were in many ways very remarkable, The average was exceeded from the Qu'Appelle to the lower St. Lawrence valleys, also in the southwestern portion of the Maritime Provinces, but elsewhere in Canada it was not maintained. Two large areas of excessive and deficient temperature conditions of almost equal opposite values prevailed in the Dominion. The deficient area, with temperatures from 6° to 8° below average, embraced practically the whole mainland of British Columbia, whilst the excessive area, with temperatures from 6° to 8° above average, covered the country from the western portion of Lake Superior to central and southern Ontario. Toronto was 6° above average. The warmest August since records have been kept, which is from 1840, and from the conditions generally prevailing, it is fair to assume that in Ontario, as a whole, August, 1900, was the warmest August for sixty years. The greater portion of the Northwest Territories was from 0° to 3° below average, and eastern Quebec and the eastern portion of the Maritime Provinces was from average to 1° below.

PRECIPITATION.

Rainfall was below normal in the lower Mississippi Valley, the east Gulf and south Atlantic States, the Ohio Valley, the Middle States, the lower Lake region, and New England. Over this large area local rains and thunderstorms occurred on three different periods, but the amount of rain that fell on each occasion was generally small. Within this large area of general deficiency very few stations received as much as the normal rainfall; on the other hand the rainfall in several districts was almost *nil*. Pastures were burned up, and there was a scarcity of water for stock and domestic purposes.

In the Northwest frequent heavy thundershowers brought an abundance of rain, especially in southeastern Nebraska, the Dakotas, Minnesota, and northern Wisconsin.

In the Southwest, including Colorado and Wyoming, rainfall was markedly deficient. The fall on the north Pacific coast was slightly above normal. There was practically no rain over the greater portion of California and Nevada.

In Canada.—Acting Director B. C. Webber says:

The rainfall was largely above the average over the greater portion of British Columbia and the Northwest Territories. It was also considerably above in Manitoba, the Lake Superior region, the Nipissing district, and north of the Ottawa River. It was also a little above south and west of Lake Simcoe, to the United States boundary, but elsewhere in Canada it was below average. The Georgian Bay and Muskoka regions suffered much from drought; at Parry Sound the rainfall was nearly 2 inches below the usual amount, whereas 100 miles further north it was above the average. In Quebec and the Maritime Provinces the deficiency was very generally from 1 to 2 inches. Southern Alberta was also nearly an inch below the average. Barkerville, B. C., was as much as 6 inches above average; Banff, Edmonton, and Battleford, 3 inches above; Prince Albert and Port Arthur, 4 inches above.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	2.39	60	−1.6	− 2.0
Middle Atlantic	12	2.68	58	−1.9	− 5.4
South Atlantic	10	2.43	37	−4.2	− 5.5
Florida Peninsula	7	3.67	57	−2.8	+ 3.1
East Gulf	7	2.78	49	−2.9	+ 7.7
West Gulf	7	4.30	119	+0.7	+ 4.0
Ohio Valley and Tennessee	12	2.85	80	−0.7	− 6.6
Lower Lake	8	2.64	90	−0.3	− 0.4
Upper Lake	9	3.91	130	+0.9	− 2.2
North Dakota	8	5.85	221	+3.2	− 0.9
Upper Mississippi Valley	11	3.72	123	+0.7	− 1.9
Missouri Valley	10	4.08	128	+0.9	+ 0.2
Northern Slope	7	1.54	115	+0.2	− 1.6
Middle Slope	6	1.45	55	−1.2	− 1.3
Southern Slope	6	1.76	69	−0.8	+ 2.5
Southern Plateau	15	0.58	37	−1.0	− 1.8
Middle Plateau	9	0.25	38	−0.4	− 3.3
Northern Plateau	10	0.81	67	−0.4	− 2.3
North Pacific	9	1.17	134	+0.3	− 0.3
Middle Pacific	5	0.02	100	0.0	− 4.3
South Pacific	4	T.	100	0.0	− 4.2

HAIL

The following are the dates on which hail fell in the respective States:

Alabama, 2, 15, 27. Arizona, 4, 17, 18, 30. Arkansas, 25. California, 1. Colorado, 2, 4, 7, 8, 11, 20, 21, 22, 23, 30. Florida, 22, 25. Georgia, 24, 25, 30. Idaho, 1, 5, 7, 22. Illinois, 1, 13, 14, 15, 17, 19, 21, 23, 24, 25. Indiana, 24, 25. Indian Territory, 25. Iowa, 12, 14, 15, 16, 17, 23. Kansas, 11, 15, 21, 22, 24, 25, 27, 28. Kentucky, 1, 2, 3, 12, 15, 28. Louisiana, 26, 27. Maryland, 3, 18. Michigan, 14, 17, 19. Missouri, 12, 15, 21, 24, 25, 27. Montana, 4, 6, 7, 8, 9, 11, 14. Nebraska, 11, 12, 13, 14, 15, 16, 21, 23, 24, 26, 27. Nevada, 1, 2, 19, 22. New Jersey, 6, 7, 15, 17, 29. New Mexico, 5, 6, 7, 9, 17, 30. New York, 1, 2, 11, 24, 26, 28. North Carolina, 11, 14, 16, 21, 22, 29. North Dakota, 9, 10, 12, 14, 20, 21, 22, 30. Ohio, 3, 12, 15, 19, 20, 22, 24, 25, 31. Oklahoma, 23, 25. Pennsylvania, 6, 11, 16, 17, 18, 20. South Dakota, 13, 23, 31. Tennessee, 20, 22. Texas, 26. Utah, 5, 18. Virginia, 7, 22. Washington, 10, 21, 25, 26. West Virginia, 16, 18, 19. Wisconsin, 2. Wyoming, 5, 9, 10, 21.

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Hatteras, N. C.	20	75	nw.	Mount Tamalpais, Cal.	27	51	nw.
Indianapolis, Ind.	12	52	nw.	Do.	29	58	nw.
Lincoln, Nebr.	15	54	nw.	New York, N. Y.	12	76	nw.
Do.	21	78	w.	Norfolk, Va.	16	52	nw.
Do.	23	54	nw.	Do.	24	50	sw.
Memphis, Tenn.	26	59	nw.	Pierre, S. Dak.	11	50	n.
Mount Tamalpais, Cal.	1	52	n.	Do.	12	60	n.
Do.	10	55	w.	Do.	21	53	ne.
Do.	18	50	w.	Point Reyes Light, Cal.	6	60	nw.
Do.	19	51	w.				

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table VII, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 15th, 350; 23d, 321; 27th, 275.

Reports were most numerous from: Missouri, 335; Ohio, 320; Iowa, 276.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, 6th to 14th.

In Canada.—Thunderstorms were reported as follows: Halifax, 4th, 27th; Charlottetown, 1st, 28th; Father Point, 24th; Quebec, 2d, 15th, 16th, 22d, 24th, 26th; Bissett, 14th, 25th, 30th; Ottawa, 2d, 5th, 6th, 14th; Kingston, 15th, 18th; Toronto, 7th, 9th, 11th, 13th, 18th; White River, 5th, 9th, 14th, 16th, 19th, 25th 30th; Port Stanley, 6th, 8th, 12th, 20th, 27th; Saugeen, 11th, 20th, 25th, 27th; Parry Sound, 5th, 14th; Port Arthur, 5th, 13th, 18th, 19th, 21st; Minnedosa, 8th, 9th, 12th, 13th, 17th, 18th, 22d, 25th, 26th, 29th, 30th; Qu'Appelle, 2d, 6th, 7th, 9th, 10th, 11th, 12th, 16th, 17th, 18th, 20th, 21st; Medicine Hat, 30th; Swift Current, 1st, 6th, 8th, 9th, 10th, 12th, 16th, 17th, 22d, 26th, 30th; Banff, 4th; Prince Albert, 18th; Victoria, 1st; Hamilton, Bermuda, 3d, 5th, 9th, 17th, 20th, 22d, 23d, 29th; Barkerville, 24th.

Auroras were reported as follows: Prince Albert, 23d.

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	4.7	−0.3	Missouri Valley	3.9	−0.2
Middle Atlantic	3.9	−1.1	Northern Slope	4.4	+0.7
South Atlantic	3.2	−2.0	Middle Slope	3.6	−0.2
Florida Peninsula	5.3	+0.1	Southern Slope	3.2	−1.6
East Gulf	4.4	−0.5	Southern Plateau	2.2	−1.2
West Gulf	4.6	+0.2	Middle Plateau	2.8	+0.6
Ohio Valley and Tennessee	3.7	−0.8	Northern Plateau	4.5	+1.5
Lower Lake	4.4	−0.1	North Pacific Coast	5.3	+1.4
Upper Lake	5.5	+0.7	Middle Pacific Coast	3.3	+0.5
North Dakota	3.9	0.0	South Pacific Coast	3.2	+0.7
Upper Mississippi	3.8	−0.3			

HUMIDITY.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	80	− 2	Missouri Valley	68	+ 1
Middle Atlantic	72	− 3	Northern Slope	55	+ 4
South Atlantic	76	− 6	Middle Slope	56	− 5
Florida Peninsula	79	− 2	Southern Slope	64	0
East Gulf	77	− 3	Southern Plateau	31	−17
West Gulf	79	+ 5	Middle Plateau	27	− 5
Ohio Valley and Tennessee	71	0	Northern Plateau	46	+ 3
Lower Lake	74	+ 4	North Pacific Coast	75	− 3
Upper Lake	80	+ 6	Middle Pacific Coast	63	− 5
North Dakota	71	+ 8	South Pacific Coast	67	+ 4
Upper Mississippi	73	+ 3			

DESCRIPTION OF TABLES AND CHARTS.

By ALFRED J. HENRY, Professor of Meteorology.

For description of tables and charts see page 214 of REVIEW for May, 1900.